REMARKS/ARGUMENTS

Claims 1-39 are pending in this application. Claims 1, 10, 12, 13, 15, 17, 19-25, 28-30, 32, 34, 35, 38 and 39 have been amended to clarify certain aspects of these claims. None of the amendments have been made for the purposes of patentability, and the subject matter of the claims is supported by the originally filed specification. Please examine claims 1-39 as amended.

Respectfully submitted,
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APPENDIX

VERSION WITH MARKINGS TO SHOW CHANGES MADE

In the Claims:

1. (Amended) A miniature resonating marker assembly, comprising

a signal element comprising a core~~;~~, a wire coil disposed around the core~~;~~ and a capacitor connected to the wire coil, ~~adjacent to the core to form a~~ the signal element ~~that~~ generate~~s~~ing a magnetic field with a selected resonant frequency in response to a specific stimulus, and the magnetic field having a magnetic center along a first axis of the ~~unit~~core; and

an inert encapsulation member encapsulating the signal element, the encapsulation member and the signal element therein defining a unit having a selected geometric shape ~~of the resonating marker assembly, the geometric shape~~ having a geometric center, the geometric center being coincident with the magnetic center along at least the first axis of the ~~unit~~core.

10. (Amended) The miniature resonating marker assembly of claim 1 wherein the core has a rod portion positioned in the coil, a first endcap connected to an end portion of the rod portion, and a second endcap connected to another end portion of the rod portion, the first endcap being axially adjustable over the rod portion and relative to the coil.

12. (Amended) The miniature resonating marker assembly of claim 1 wherein the geometric center is coincident with the magnetic center along three axies of the unit.

13. (Amended) The miniature resonating marker assembly of claim 1, further comprising a sleeve positioned between the wire coil and the core, the wire coil being

wound onto the sleeve, and the sleeve and coil being positioned over the core ~~as a unit~~.

15. (Amended) The miniature resonating marker assembly of claim 1, further ~~comprises~~ comprising a ferromagnetic adhesive securely retaining the coil on the core.

17. (Amended) The miniature resonating marker assembly of claim 1 wherein the unit is attached to an anchoring member extending from one end of the unit, and the anchoring member is shaped to anchor the unit to tissue in or on a patient.

18. The miniature resonating marker assembly of claim 1 wherein the assembly has an axial length of approximately 14 mm or less.

19. (Amended) A miniature resonating marker assembly having a geometric center, comprising:

a core having an elongated central portion, a ~~and~~ first ~~and second endcaps attached to~~ cap having a first thickness ~~at one area of the central portion,~~ and a second cap ~~at another area of the central portion~~having a second thickness, wherein the first thickness is different than the second thickness~~, the first endcap having an axial~~ a first thickness ~~difference~~t ~~from~~ than ~~a second thickness of~~ the second ~~endcap to define an asymmetric core along at least one axis through the core~~;

a wire coil disposed around the central portion of the core between the first and second ~~end~~caps; and

a capacitor connected to the wire coil ~~adjacent~~ proximate ~~to the core~~operative to form a signal element that generates a magnetic field with a selected resonant frequency in response to a specific stimulus~~, the magnetic field having a magnetic center along a first axis of the unit, the magnetic center being coincident with the geometric center of~~ an image of ~~the resonating marker assembly~~.

20. (Amended) A resonating marker assembly having a geometric center, comprising:

a ferromagnetic core having an elongated central portion and first and second ferromagnetic endcaps ~~attached to~~ at opposite ends of the central portion, the core being substantially symmetrical about a longitudinal axis of the core, and being asymmetrical about a lateral axis of the core;

a wire coil disposed around the central portion of the ferromagnetic core intermediate the first and second endcaps; and

a capacitor connected to the wire coil ~~adjacent to the ferromagnetic core to~~forming a signal element that generates a magnetic field with a selected resonant frequency in response to a specific stimulus, the magnetic field having a magnetic center along a first axis ~~of the unit, the magnetic center being~~ coincident with the geometric center of the resonating marker assembly.

21. (Amended) A resonating marker assembly having a geometric center, comprising:

a core having an elongated central portion and first and second endcaps connected to the central portion~~, the first endcap being axially movable relative to the central portion~~;

a wire coil disposed around the central portion of core intermediate the first and second endcaps; and

a capacitor connected to the wire coil ~~adjacent~~ proximate ~~to the core~~ to form a tuned signal element that generates a magnetic field with a selected resonant frequency in response to a specific stimulus, the first endcap being movable relative to the coil and capacitor for tuning the marker assembly to a selected resonant frequency.

22. (Amended) A resonating marker assembly, comprising:

a sleeve;

a core having a central portion extending through the sleeve and a pair of endcaps connected to the central portion, the sleeve being between the endcaps, and the core being axially movable relative to the sleeve;

a wire coil disposed around the sleeve; and

a capacitor connected to the wire coil ~~adjacent~~ proximate to the core to form a signal element that generates a magnetic field with a selected resonant frequency in response to a specific stimulus, the core being axially movable relative to the sleeve and the coil for tuning the marker assembly to a selected resonant frequency.

23. (Amended) A tunable, resonating marker assembly, comprising:

a wire coil defining an interior area;

a capacitor connected to the wire coil to form an electrical circuit; and

a ferromagnetic core ~~adjacent to the capacitor, the core~~ having first and second segments each extending at least partially into the interior area of the coil, the first and second segments being axially movable relative to each other and to the coil for tuning the marker assembly to a selected resonant frequency.

24. (Amended) A resonating marker assembly, comprising:

a ferromagnetic core having ~~an end portion~~a first end and a second end~~with a recess formed therein~~;

a wire coil disposed around the ferromagnetic core; ~~and~~

a capacitor positioned ~~in the recess in the core's end portion~~at the first end of the core and operatively connected to the wire coil ~~adjacent to the ferromagnetic core~~ to form a signal element that generates a magnetic field with a selected resonant frequency in response to a specific stimulus; and

a segment at the second end of the core that projects outwardly with respect to the longitudinal axis of the core.

25. (Amended) A resonating marker assembly, comprising:

a core ~~having a central portion intermediate to a pair of enlarged endcaps,~~ first endcap ~~having a recess and a second endcap, the central portion having a first magnetic permeability and the enlarged endcaps having a second magnetic permeability different than the first magnetic permeability~~;

a wire coil disposed around the core ~~intermediate to the endcaps~~;

a capacitor ~~positioned in the recess in the core's end portion~~ first endcap ~~and~~ operatively connected to the wire coil ~~adjacent to the core~~ to form a signal element that generates a magnetic field with a selected resonant frequency in response to a specific stimulus; and

an inert encapsulation member encapsulating the core, the wire coil, and the capacitor forming an activatable unit implantable in a patient through an introducer needle.

28. (Amended) A method of actively tuning a resonating marker assembly to have a selected resonant frequency value, comprising:

winding an elongated wire around a central portion of a ferromagnetic core intermediate a pair of ferromagnetic endcaps of the core to form a coil with a plurality of windings, the coil and core forming a combination with a first inductance value;

measuring the first inductance value of the combination;

comparing the measured first inductance value to ~~the selected~~ a reference inductance value; and

adjusting the amount of wire forming the coil after comparing the measured first inductance value to the ~~selected~~ reference inductance value by adding or removing one or more turns from the coil until ~~the~~ an inductance value of the combination is substantially equal to the ~~selected~~ reference inductance value.

29. (Amended) A method of tuning a miniature resonating marker assembly to a selected resonant frequency, comprising:

placing a ferromagnetic core within a wire coil having a plurality of windings to form an inductor;

connecting lead wires of the inductor to a capacitor, the capacitor being ~~adjacent~~ proximate to the core to form a miniature signal element;

exciting the marker assembly at a known frequency;

measuring ~~the~~ a marker signal intensity or a signal phase at ~~the~~ a frequency of interest; and

adjusting the core axially relative to the windings to adjust ~~the~~ an actual inductance until ~~the~~ a resonant frequency of the marker matches the ~~desired~~ selected resonant frequency.

30. (Amended) A method of tuning a miniature resonating marker assembly to a selected resonant frequency where the impedance of ~~the~~ an inductor and a capacitor are matched at ~~a~~ the selected resonant frequency, comprising:

placing a core within a wire coil having a plurality of windings to form an inductor;

connecting lead wires of ~~the an~~the inductor to a capacitor with ~~the~~ a known capacitance, the capacitor being ~~adjacent~~ proximate to the core to form a miniature signal element;

measuring ~~the~~ an actual resonant frequency of the signal element; and

~~comparing the actual resonant frequency of the signal element to the selected resonant frequency; and~~

adjusting the core axially relative to the ~~winding to adjust the actual resonant frequency~~ wire coil until the actual resonant frequency is ~~substantially equal to~~ within a desired range of the selected resonant frequency.

32. (Amended) The method of claim 30, further comprising winding the coil onto a sleeve with an interior area, and wherein placing the core within the wire coil includ~~in~~ges placing the core within the interior area of the sleeve.

34. (Amended) The method of claim 30 ~~wherein the core includes a central portion within the coil and~~ further comprising providing the core with a pair of endcaps, and wherein the adjusting step comprises ~~further comprising positioning an endcap on an~~ at an end portion of ~~the core's central portion adjacent~~ proximate to the coil, ~~and~~ adjusting the core axially ~~includesingby~~ moving one of the endcaps ~~axially on the central portion relative to the coil~~relative to the coil along an axis of the core.

35. (Amended) The method of claim 3~~0~~4, further comprising securing the endcap on the ~~core's~~ central portion in a fixed location after the resonant frequency is substantially equal to the selected resonant frequency.

38. (Amended) A method of making a tuned, miniature resonating marker assembly with a selected inductance, a known capacitance, and a selected resonant frequency comprising:

placing a wire coil around a ferromagnetic core having a central portion within the coil and a pair of ferromagnetic endcaps attached to the central portion adjacent to the coil;

connecting a capacitor to lead wires of the wire coil, the capacitor having a known capacitance and being ~~adjacent~~ proximate to the core~~,~~ and the coil~~, and the capacitor~~ to form an activatable assembly;

measuring ~~the~~ an actual ~~impedance and phase~~ resonant frequency of the activatable assembly;

comparing the actual resonant frequency to the selected resonant frequency; and

removing ferromagnetic material from the core to adjust the actual resonant frequency of the activatable assembly until the actual resonant frequency is substantially equal to the selected resonant frequency.

39. (Amended) A method of tuning a miniature resonating marker assembly to a selected resonant frequency, comprising:

placing a ferromagnetic core within a wire coil having a plurality of windings to form an inductor;

connecting lead wires of the inductor to a capacitor, the capacitor being ~~adjacent~~ proximate to the core to form a miniature signal element;

exciting the marker assembly at a known frequency; and

~~measuring the marker signal intensity or signal phase at the frequency of interest; and~~

removing ferromagnetic material from the core to adjust ~~the~~ an actual inductance of the activatable assembly until ~~the~~ an actual resonant frequency of the marker matches the ~~desired~~ selected resonant frequency.